astronomy

Black holes in the centers of galaxies?

Proponents of the big-bang theory of cosmology have trouble fitting the evolution of galaxies into the theory. Several analyses seem to show that if the universe began with the explosion of a smooth uniform fluid, small fluctuations of density in that fluid would not grow into galaxies.

In the Oct. 15 ASTROPHYSICAL JOURNAL LETTERS Michael P. Ryan Jr. of the University of Texas at Austin proposes that galaxies be thought of as matter that has accreted around a black hole. A black hole at the center of our galaxy has already been proposed to account for the flux of gravitational waves that seems to be coming from the center. Ryan presents an analysis to show that a central mass between 1 million and 10 million times that of the sun would have caused our galaxy to accrete to its present size from a very small density perturbation. He suggests that every galaxy larger than about 10 million solar masses could be expected to have a black hole at its center. The black holes would have been there from the earliest times, their origin being possibly in the big-bang explosion itself.

The asteroids and the tenth planet

One long-standing hypothesis about the origin of the asteroids regards them as debris left over from a planet that broke up. The supposition is strengthened by a 200-year-old empirical formula for determining the major axis (maximum distance from the sun) of a planet's orbit, Bode's law, which works within a few percent if the fifth Bodean orbit is left vacant. Astronomers looking for a planet in that orbit found the first asteroid to be discovered.

In the Oct. 27 NATURE M. W. Ovenden of the University of British Columbia points out that although Bode's law itself seems to have no physical significance, some physical principle must underlie the regularity it expresses. Ovenden proposes what he calls the Principle of Least Interaction Action: A satellite (or planetary) system will spend most of its time near a configuration for which the sum of all the gravitational interactions between the various pairs is a minimum. Finding that this principle describes well the satellite systems of Uranus and Jupiter, Ovenden applies it to the solar system and comes to suggest that a planet with about 90 times the mass of the earth occupied the fifth orbit and broke up between 12 million and 20 million years ago.

VLBI for geodesy

Very-long-baseline interferometry, in which signals received from a celestial source at widely separated locations are combined, has helped astronomers greatly in their efforts to discover the structure of small, distant sources. It can also be used to determine the distance between the receiving stations to a high precision as a report in the Oct. 27 SCIENCE (H. F. Hinteregger et al) shows. The distance between antenna sites in Massachusetts and West Virginia (845.130 kilometers) agreed within two meters with a special geodetic survey. The promise for the future is to use VLBI for measuring continental drift, but that, according to these investigators, is still a long way from fulfillment.